OCHRATOXIN A IN WINES: CURRENT KNOWLEDGE

LAST PART: LITTLE ROOM FOR CORRECTIONS IN THE CELLAR

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High efficiency of bunch sorting.

Sorting bunches upon harvest reception allows reducing the risk of Ochratoxin A appearance significantly. A trial carried out in 2002 by the ICV R&D Department with Chardonnay clearly showed this: the healthy bunches selected produced a wine with very little Ochratoxin A, compared with the poor quality bunches, which produced a highly contaminated wine.

Plot selection and, if possible, bunch sorting in the vineyard or upon reception in the cellar to remove grapes in poor hygienic condition, are efficient measures to reduce wine Ochratoxin A levels.

![Graph showing the reduction of Ochratoxin A levels in wine from spoiled versus healthy bunches.](image)

*Figure 1: Bunch sorting carried out in the ICV pilot winery with a Chardonnay batch allowed to produce a wine containing very little Ochratoxin A.*

Preventive oenological measures: rather limited impact of technological options

The grape Ochratoxin A potential is almost entirely responsible for the contamination levels found in wines. No vinification protocol can significantly reduce Ochratoxin A levels in wines produced from very contaminated grapes.

Thus, the potential risk of Ochratoxin A contaminations does not question the good vinification practices to be implemented in order to achieve the various technological and sensory objectives.

The vinification study carried out in the ICV pilot winery allowed to assess the absence of an influence, or the presence of a slight effect of different factors on wine Ochratoxin A contaminations.

Red winemaking
### Duration of the fermentation on skins:
The duration of the fermentation on skins did not appear to have a significant effect with crushed and destemmed grapes: in 3 out of 4 experiments an extension of the fermentation durations from 5 to 21 days even led to a slight reduction of wine Ochratoxin A levels.

### Pressing:
There was no significant difference between Ochratoxin A levels found in free run juice and press juice produced from contaminated grapes.

### Thermovinification
- Heat treatments do not prevent the development of Ochratoxin A (in the case of thermovinification or flash pasteurization of grapes or musts). Heat treatments do not destroy Ochratoxin A in a contaminated wine, either.
- A study carried out in 2002 with thermovinification equipment did not reveal an incubation effect: there was no steady increase in Ochratoxin A levels of juices sampled at different points of the system. Proper cleanings allow to eliminate Ochratoxin A traces (absence of OTA in the rinsing water).

### White and rosé winemaking

#### Sulphiting:
Early sulphiting of grapes slightly reduces the Ochratoxin A contamination level of white and rosé wines.

#### White and rosé juice extraction:
In 2 out of 3 trials, skin maceration followed by draining led to slightly lower Ochratoxin A levels than direct pressing (-24%). It appears that the intensity of skin manipulation increases Ochratoxin A contaminations.

### Wine ageing

#### Bottle ageing:
If filtered wines are aged in bottles, Ochratoxin A levels decrease steadily, but with a high variation among wines independently of their initial contamination level. No explanation has been found yet: fine composition of wines, ageing conditions,…

#### Sur-lie ageing:
Yeast lees ageing with stirring leads to a somewhat stronger reduction of Ochratoxin A than bottle ageing of the same and filtered wine. A hypothesis for this effect is the absorption of Ochratoxin A by the mannoprotein wall of yeasts. However, sur-lie ageing is neither appropriate nor applicable to all wine types.

### Corrective measures with red wines: the authorized finings have little effect on contaminations

The authorized oenological fining agents display poor efficiency with Ochratoxin A contaminated red or white wines: Gelatin, bentonite, silica gel and tannins – used alone or in combination – reduce only 7 to 14% of the Ochratoxin A naturally present in wines. Filtrations improve this reduction to some degree, but without exceeding 20% of total reduction. These treatments do not allow to reduce the Ochratoxin A levels of highly contaminated wines to low values.
Active carbon treatments, which are not allowed in red winemaking, are the only efficient remedy to significantly reduce Ochratoxin A levels. Applied at 20 g/hl in laboratory tests, active carbon finings are efficient, but have a disastrous effect on quality: Loss of 25 to 30% of red wine colour, pronounced aroma and flavour depreciation.

Clear differences can be found between the Ochratoxin A removal efficiency among different active carbons applied at the same dose. The ICV study showed an OTA reduction rate of 50 to 80%, which was in tight correlation with the adsorbing power of the activated carbons as assessed by the DGCCRF laboratory in Bordeaux.

Control of the Ochratoxin A risk in wines:

Establish a monitoring plan

- Take an analytical inventory of the various tanks in the cellar in order to assess the Ochratoxin A risk.
- Identify the plots which are responsible for the batches with highest Ochratoxin A contaminations to study possible risk factors, and measures to be considered for the next vintage.
- Analyse the wines originating from these plots before blending in order to confirm the effectiveness of the preventive measures taken, and refine the search for the origins of Ochratoxin.
- Continue to carry out regular analytical surveys in order to validate the appropriate control of the Ochratoxin risk in the entire cellar.

Prevention in the vineyard: where everything is decided!
- Avoid leaf and grape overcrowding through control of the vigour, pruning, trellising, careful tying-up and leaf thinning.
- Implement thorough plant protection treatments.
- Limit perforation caused by grape caterpillars
  o Control grape caterpillar development, especially in plots intended for high maturities
  o Careful timing of treatments (traps, monitor egg-laying)
  o Ensure treatment quality (treatment of both bunch sides)
  o Favour preventive treatments (maturing disruption, oxicidal and early larvicidal treatments).
- Consider the secondary effect of fungicides on Ochratoxin A
  o Advantage of late Fosetyl-Al treatments (between setting and bunch closure)
  o Select anti-botrytis agents according to their action on Aspergillus in the field.

NB: All treatments have to remain justified by the risk represented by the plant disease against which the fungicide was authorized: Prevention in the vineyard must not lead to unnecessary treatments, or to treatments outside authorized periods. Be aware of the risk represented by pesticide residues on grapes.

Maturity control and grape delivery organisation
- Prevent grape damage, limit transport durations, avoid heating of the harvest.
- Apply good cleaning and disinfection practices with regards to harvesters, containers, trailers, and any transport material, such as receiving bins, conveyor belts, pumps, pipes…

Vinification
- Harvest without further delay even if grapes, whose sanitary quality is degrading, haven’t reached phenolic maturity.
- Proceed to bunch sorting upon reception to remove bunches of bad sanitary quality (including those only affected by grape caterpillar damage, without botrytis or sour rot).
- Implement winemaking procedures which are adapted to your product objectives: Good winemaking practices are not challenged by the Ochratoxin A risk, since no vinification method allows to significantly reduce Ochratoxin A levels in wines originating from highly contaminated grapes.
### Summary Table: Efficiency of various procedures on the control of Ochratoxin A risks

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<thead>
<tr>
<th>Stage</th>
<th>Procedure</th>
<th>Ochratoxin A prevention</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>None</td>
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<tr>
<td>VINE</td>
<td>Control of vine vigour</td>
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<td></td>
<td>Trellising, tying-up</td>
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<tr>
<td></td>
<td>Leaf thinning</td>
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<tr>
<td></td>
<td>Control of sanitary quality</td>
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<tr>
<td></td>
<td>Preventive grape caterpillar treatments</td>
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<tr>
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<td>Curative grape caterpillar treatments</td>
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<td></td>
<td>Fosetyl-Al application before setting</td>
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<tr>
<td></td>
<td>Fosetyl-Al application after setting</td>
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<td></td>
<td>Anti botrytis treatments</td>
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<tr>
<td>HARVEST</td>
<td>Early grape harvest if sanitary quality is degrading</td>
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<tr>
<td></td>
<td>Prevent grape damage during transport</td>
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<td>Bunch sorting</td>
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<td></td>
<td>Early grape sulphiting</td>
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<tr>
<td>VINIFICATION</td>
<td>White and rosé juice extraction by draining rather than pressing or dynamic drainage)</td>
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<td></td>
<td>Reduction of maceration durations</td>
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<td>Filtration</td>
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<td></td>
<td>Finings</td>
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<td></td>
<td>White wine fining with active carbon</td>
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<td></td>
<td>Sur-lie ageing</td>
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